4.0 MITIGATION MEASURES

4.1 Unresolved Environmental Issues

The KYTC will explore context sensitive solutions for communities and other necessary mitigation as the project evolves.

4.1.1 Noise

Although all three build alternates have receptor sites which qualify for noise barrier construction, both in terms of noise reduction and cost-effectiveness **(See Section 3.2.5)**, additional coordination with the affected public will be undertaken before further implementation of barrier construction. If, after approval of this Environmental Assessment, a build alternate is selected for further implementation, the KYTC will hold meetings with affected residents to discuss noise barriers. After the desires of affected persons are determined, the KYTC will make a final decision about the construction of specific noise barriers.

4.1.2 Wetlands

Impacts to wetlands **(See Exhibit 13 and Table 11)** should be (1) avoided, (2) minimized and/or (3) mitigated, in that priority order.

Even though it is not possible to avoid encroaching on some wetlands, every effort will be made to minimize the impacts. Such efforts may include the use of retaining walls, steeper slopes or reduced right-of-way takes outside construction limits. Unavoidable impacts will be mitigated according to state and federal regulations. Special precautions will be taken so that excess sediments from construction activities do not enter the wetlands.

If one of the build alternates is selected for further implementation, discussions with regulatory agencies regarding wetland impacts will be initiated following the approval of the Environmental Assessment. The exact determination of impacts to jurisdictional wetlands will be made by the KYTC's Division of Environmental Analysis after final design. A detailed mitigation plan will be prepared as part of the construction plans.

If the **Crossover** or **South Alternate** is chosen for construction, an Individual Section 404 Permit from the U.S. Army Corps of Engineers may be required because more than 0.5 acres of jurisdictional wetland area will be taken. While an Individual Section 404 Permit would not be required of the **North Alternate**, a 404 Nationwide Permit would need to be obtained. A Section 401 Water Quality Certification from the Kentucky Department of Environmental Protection's Division of Water also may be required for the Crossover and the South Alternates because they affect more than one acre of wetland area.

There is a wetland banking option for the Kentucky River and Cumberland River watersheds that should be considered when deciding how to mitigate the affected wetlands for this project.

4.1.3 Threatened or Endangered Species

Although impacts to threatened or endangered species are not anticipated, further Section 7 coordination with the U.S. Fish and Wildlife Service will be conducted by the KTYC's Division of Environmental Analysis, if one of the build alternates is chosen for construction. If necessary, a biological assessment/evaluation for species listed at that time will be completed by the KYTC prior to the acquisition of right of way.

4.1.4 Archaeological Resources

A total of potentially seven archaeological sites (Sites 4, 9, 10, 14, 30, 46, and Sweeney Cemetery) will require Phase II testing. Once an alternate is selected for further project development and access is obtained to those sites requiring further investigation, the KYTC Division of Environmental Analysis will conduct the necessary field studies and report the results of those investigations to the State Historic Preservation Officer for review and comment. Mitigation measures will be determined at that time.

The Sweeney Cemetery posed an initial concern during this study. Survey results indicated that the proposed North Alternate's disturbance limits would enter the current fenced limits of the existing cemetery. Approximately three existing grave markers were to be impacted by the road construction as well as several suspicious surface depressions. Oral history of the area also suggested the presence of unmarked graves. Later in the study, it was determined that the impact on the cemetery could be reduced or eliminated by a North Alternate alignment modification. This change results in a low probability of encountering unmarked graves. However, a shallow mechanical excavation of 1-2 trenches along the disturbed limits to look for evidence of grave shafts should be undertaken before construction. This would ensure that project delays are not incurred during the construction phase of the project.

4.1.5 Hazardous Materials/Underground Storage Tank Sites

The Build Alternates will impact 5-8 potential hazardous materials sites, as shown in **Exhibit 20** and **Table 25**. Depending upon the alternate selected, a limited or full Phase II Assessment has been recommended for each of these sites. Once the Public Hearing has been held and the Selected Alternate has bee determined, a Phase II hazardous materials investigation will be initiated. These surveys will be completed prior to the acquisition of new right of way unless the KYTC is unable to obtain access to the property where the hazardous materials site is located. These sites will be tested once legal right to enter the property has been obtained. The results of the Phase II investigation, including the estimated remediation costs, will be coordinated with the FHWA as part of a project reevaluation to ensure that previous decisions remain valid. The proposed project will not be advertised for construction until contamination clearances are obtained.

4.2 Site-Specific Mitigation

4.2.1 Caves and Karst Features

Caves, sinkholes and springs **(See Section 3.3.2)** will be avoided where it is practical to do so. Special efforts will be undertaken in the design and construction of the proposed improvement to protect these resources. If the South Alternate is selected for further implementation, further studies will be needed to determine extent of Cave G and measures necessary to minimize impacts on it. Precautions will be taken to protect cave ecosystems to the greatest extent possible. Stormwater runoff will not be directed into these cave systems.

Springs will be provided appropriate drainage outlets and protection from surface contamination. Permanent erosion control basins will be provided for affected sinkholes, to filter roadway runoff and to protect sinkholes from hazardous chemical spills by temporarily retaining the material until it can be cleaned up.

4.2.2 Water Supplies

In order to avoid and minimize adverse impacts to groundwater, best management practices to control erosion, sediment ad runoff should be implemented in accordance with the sedimentation and erosion control plan for the project, the KYTC Generic Groundwater Protection Plan, and Sections 212 and 213 of the Standard Specifications Manual.

4.2.3 Streams

Along the channelized portions of streams in this project **(See Section 3.3.4)** measures will be implemented which attempt to restore original stream morphology and length. Since channelization most often results in a net increase in stream velocity, measures will be implemented to compensate for and reduce this increase.

The KYTC will follow the requirements of Section 212 and 213 in the Kentucky Department of Highways Standard Specifications and employ best management practices to protect surface waters. Erosion control plans will be provided during the design phase. These plans will identify the use of such devices as silt checks, silt traps, silt fences, diversion channels, and sedimentation basins.

An Individual Section 404 Permit from the U.S. Army Corps of Engineers may be required for the North and Crossover Alternates due to their channel change impacts of 1,380 feet and 720 feet, respectively. An Individual Section 401 Water Quality Certification may be required if placement of culverts in a given stream will exceed the 200 linear feet threshold. Culverts less than 200 linear feet in length will require a General Section 401 Water Quality Certification from the Kentucky Department of Environmental Protection's Division of Water.

4.2.4 Vegetation

Revegetation of the construction area should occur in a timely progression when sections of the improvement are completed. The selection of plant species to be used will be native to this region. Tree species will be planted along areas adjacent to streams which were forested prior to construction. Likewise, herbaceous seeding (native) will be completed for non-forested streambanks. A sufficient amount of soil will be stored during construction for revegetation of streambanks subsequent to construction.

4.3 General Mitigation Measures During Construction

The following general measures are recommended for minimizing adverse impacts which may result during construction of the proposed project.

A) Sufficient lead time should be given so that the necessary residential displacements can be made into safe and sanitary housing within the financial capabilities of all the proposed displaces without discrimination. This lead time is estimated at 12 to 18 months. Last resort housing provisions should be implemented if there is extreme difficulty in making relocation.

B) Dust and other air pollutants should be controlled to the greatest extent practical, especially in the vicinity of environmental sensitive areas, such as residential areas.

Temporary air quality impacts will occur within the immediate vicinity of construction activities. These activities and the equipment used in them will generate air pollutants such as carbon monoxide (CO) and particulates under 10 microns in diameter (PM 10). CO is a component of motor vehicle/equipment exhaust and PM 10 is caused by fugitive dust emissions resulting from soil exposed to wind and traffic. The quantity of fugitive dust from construction activities varies depending on the area of land being worked, the level of activity, the soil silt content, the soil moisture, and wind speed. While the contribution of the proposed project to the total suspended particulates in the surrounding area will be small and of short-term duration, the construction will generate fugitive dust that may be a nuisance in nearby areas.

Construction vehicles will emit carbon monoxide, hydrocarbons and nitrogen oxides. Ambient air concentrations in the immediate project area will not be significantly altered by operating construction vehicles and machinery. The emission of air pollutants will be reduced by the use of properly maintained construction equipment and the use of tarp covers on trucks transporting refuse and construction waste products. Restoration of the site with grass and other plantings will further minimize fugitive dust emissions.

During construction, blowing dust from areas cleared or excavated from access or construction purposes can be minimized in several ways. Water can be applied to unpaved road surfaces with a water sprinkler truck. On roads carrying heavy

construction traffic, crushed gravel can be spread in conjunction with the normal sprinkling of the road with water. The effectiveness of watering for fugitive dust control depends on the frequency of application. It is estimated that twice daily watering over the entire area would reduce dust emissions by up to 50 percent.

C) Temporary noise impacts will occur within the immediate vicinity of construction activities. The exact noise levels can not be predicted because the specific types of construction equipment, methods and schedule are unknown at this time. However, the Contractor will be required to provide such equipment as sound deadening devices, shields, and physical barriers, and take such noise-abatement measures which may be necessary to restrict the transmission of noise. Such measures are especially important in the immediate vicinity of noise-sensitive sites such as residential areas. Noise abatement measures may include, but not necessarily be limited to, the following:

1. Provide sound-proof housing or enclosures for stationary noise producing machinery such as drills, augers, cranes, derricks, compactors, pile drivers, etc.
2. Provide efficient silencers on air intakes of equipment.
3. Provide efficient intake and exhaust mufflers on internal combustion engines.
4. Perform proper maintenance on all noise-producing equipment to prevent excessive rattling and vibration of metal surfaces.
5. Restrict construction operations in the vicinity of noise-sensitive locations to period of the day when excessive noise would be least harmful.
6. Take other measures as necessary to prevent construction noise from becoming a public nuisance or detriment to human health.

The KYTC will monitor construction noise and advise the Contractor of violation of the maximum allowable noise levels.

D) The provisions of Section 212 (Erosion Control) and 213 (Water Pollution Control) of the Kentucky Standards Specifications shall be enforced to minimize adverse impacts to surface streams, groundwater, and other aquatic features including waste sites. Specifically, this mitigation should include:

1. Erosion and sediment control measures:
    a) Preventative planning: A well-developed erosion control plan which entails a preliminary investigation, detailed contract plans and specifications, and final erosion and sediment control contingency measures should be formulated and be made part of the contract.

    b) Diversion channels: Channels should be constructed around the construction site to keep the work site free of flow-through water.

    c) Silt barriers (per Kentucky Standard Specifications Section 213.04.03): Silt traps are not to be constructed in natural stream channels. Appropriate use should be made of silt fences, hay bale and brush barriers, and silt basins in areas susceptible to erosion.

d) Temporary seeding and mulching: All cuts and fill slopes, including those in waste sites and borrow pits, should be seeded as soon as possible.

e) Limitation of instream activities: Instream activities, including temporary fills and equipment crossings, should be limited to those absolutely necessary.

2. Concrete box culverts should be placed in a manner that prevents any impediment to low flows or to movement of indigenous aquatic species.

3. Channel excavations required for pier placement should be restricted to the minimum necessary for that purpose. Overflow channel excavations should be confined to one side of the channel, leaving the opposite bank and its riparian vegetation intact.

4. All fill should be stabilized immediately upon placement.

5. Stream banks should be stabilized with riprap or other accepted bioengineering where possible.

6. Existing transportation corridors should be used in lieu of temporary crossings where possible.

7. Good water quality should be maintained during construction.

8. A note should be included in the final highway plans specifying that the project be constructed with minimal disturbance to wooded habitat. Specifically:

   a) where any right-of-way fence crosses a wooded area, trees and other natural features should remain undisturbed except as required to install the fence, and

   b) no other disturbances to wooded areas outside proposed construction limits should be permitted. This includes the use of these areas as waste sites.

9. Mitigation such as deer crossing signs is recommended in order to minimize roadkills along the proposed highway.